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RAINFALL AVERAGES AND SELECTED EXTREMES FOR CENTRAL AND SOUTH FLORIDA

by

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Water Resources Division
Resource Planning Department
South Florida Water Management District
West Palm Beach, Florida

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ACKNOWLEDGMENTS

The production of this report was made possible by the existence of a computer data base facility for daily rainfall measurements. The engineering technicians of the Water Resources Division have been responsible for maintaining and updating the data base with recorded rainfall amounts from hundreds of gages throughout the District. Gaye Lathrop handled the task of compiling and checking the data sets required for each of these maps, and for running the programs to produce the computer-generated rough drafts of the contour maps.

All the maps contained in this report were produced on the Computervision system in the Technical Services Department. The staff of the Land Resources Division, especially Louis Isern, deserves all the credit for the excellent graphical quality of the map series.

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FOR CENTRAL AND SOUTH FLORIDA

I. Introduction

The purpose of this document is to present a graphic summary of historical rainfall activity in that portion of Florida now under the jurisdiction of the South Florida Water Management District. The data are presented through a series of isohyetal maps in which the contour lines (isohyets) indicate rainfall amounts in inches.

The first group of maps (Figures 1 through 15) depicts historical rainfall averages for the wet season, dry season, calendar year, and each calendar month. The wet season includes May 1 through October 31, and the dry season is November 1 through April 30. Data were analyzed for all stations within or near the District for which a minimum of 20 years of data were available. The period of record at individual gages varied from 20 to 100 years with an average of about 35 years of record at each gage. The number of stations used for each map varied from 141 to 165 for the maps of average rainfall. Figures 1 through 3 were taken directly from District Publication 81-3, <u>Frequency Analysis of Rainfall Maximums for Central and South Florida</u>.

The second group of maps (Figures 16 through 25), illustrates a few of the more significant deviations from average conditions which have been recorded in the District area. While the average maps give a good idea of the general conditions which have prevailed for the past 40 years, it is the extreme events which dictate the design of the Central and South Florida Flood Control Project and the development of the operational criteria which govern its management. Although some of the events such as the flood of 1947 and the droughts of 1971 and 1981, have considerable historical significance, the group as a whole was chosen to demonstrate the degree of variability that is common in southern Florida.

II. Contour Mapping Procedure

A two-step procedure using mathematical and manual contour locating techniques was used to produce the maps. The first step utilized a computer plotting routine to provide rough drafts of the maps based solely on a mathematical analysis of the data. A square grid system with a spacing of 3.8 miles between points was superimposed over the District area. The location of each gage and the rainfall amount were used to estimate a rainfall value at each grid point. These grid point values were determined using a reciprocal distance squared (RDS) interpolation scheme among a fixed number of gages closest to the point. From four to eight gage values, depending on the total number of stations available for a specific map, were used to estimate each grid point. A computer contouring routine was then used to draw a set of curves throughout the grid at the specified contour levels.

Using the computer generated maps as a guide, smooth curves were drawn ignoring the numerical distortions inherent in the computer technique and considering the details about individual stations or areas that could not be directly incorporated into the mathematical formulation. Where individual station values were noticeably different from surrounding stations, the specific data were checked to determine the cause of the difference and to reflect it in the final form of the contours. In this way, stations with longer record or more reliable measuring and reporting facilities could be given more weight.

III. Selected Rainfall Occurrences

Figure 16 - Annual Rainfall 1947

This was the wettest year on record in southern Florida. Two hurricanes struck the Lower East Coast at the end of a summer that had already experienced higher than average rainfall. The flood of 1947 led to the creation of the Central and South Florida Flood Control District. A total of 86 gages were available for this map. National Weather Service gages with more than 50 years of record that list 1947 as the wettest year, include Homestead, Everglades City, Ft. Lauderdale, Hypoluxo, Ft. Pierce, Belle Glade, Canal Point, La Belle, Punta Gorda, and Arcadia. The 80.2 inches measured at Ft. Myers in 1947 is second only to the 82.6 inches recorded in 1852. Key West is the only other station in southern Florida with records for 1852. Neither 1852 nor 1947 were extreme rainfall years for Key West.

Figure 17 - Annual Rainfall 1955

This was a low rainfall year for most of the District. The eastern portions of Palm Beach, Broward, and north Dade Counties received less than 65% of average rainfall. The Kissimmee valley received about 75% of normal, while the rest of the District recorded amounts ranging from 80% to 95% of average. There were 105 gages reporting data for this map.

Figure 18 - Wet Season 1961

The 1961 wet season was one of the driest "wet seasons" on record. The Lower East Coast and the Kissimmee valley recorded about two-thirds of their historical average rainfall. Only isolated areas near Ft. Myers and Clewiston received the average for the season. A total of 182 gages were used in the analysis.

Figure 19 - Wet Season 1968

Data were available from 222 stations for this period. The entire peninsula south of Okeechobee City received heavier than normal rainfall from May through October. Some areas in Dade County recorded amounts 80% above the long term average for those months. May and June 1968 were especially wet over the Lower East Coast. Homestead recorded 39.6 inches, or 2.5 times the long term average for those two months.

Figure 20 - Dry Season 1969-1970

Dry seasons, when defined as a specific calendar period, are not always dry. Only the extreme southern tip of the state had normal rainfall amounts from November 1969 through April 1970. Lee, Collier, and Hendry Counties measured more than double their normal dry season rainfall. Palm Beach and Broward Counties had about 80% above normal, and the Kissimmee valley had 50% to 60% higher than average rainfall for the period. A very wet March was responsible for most of the rain. The contour map was based on data from 239 rain gages.

Figures 21-22 - Wet Season 1970; Dry Season 1970-1971

The drought of 1971 had a far-reaching impact on the perception of south Florida's water management needs and the institutional requirements necessary to meet them. Although the whole region experienced a deficiency, the most severe shortages were recorded in the highly urbanized coastal areas where demand was at its peak due to extensive population growth. Many observation wells measured record low groundwater levels during March and April of 1971. There were 244 stations reporting data for this period. Figure 21 shows the dry antecedent conditions which amplified the effects of the dry winter and spring of 1971. The 1970 wet season produced above average rain on the southwest coast, but the Kissimmee valley and the Lower East Coast experienced deficiencies from 20% to 30%. Therefore, the volume of groundwater and surface water storage at the beginning of the dry season was not sufficient to offset the very low rainfall of the ensuing months.

Figures 23-25 - Wet Season 1980; Dry Season 1980-1981; Wet Season 1981

The 1981 drought resulted in the lowest level ever recorded for Lake Okeechobee. It was a wet season drought centered around Lake Okeechobee and its main tributary, the Kissimmee River. The 1980-1981 dry season had approximately average rainfall with the only noticeable shortfalls showing up around the lake; however, rainfall during the preceding and following wet seasons was significantly below average. The 1980 wet season was 20% to 40% below normal for most of the District. The 1981 wet season rainfall was at or above average for most of the coastal regions, but still 20%-30% below normal in the central portion of the state. The rain that came was late and the lake did not begin its normal wet season rise until August. Data from 215 stations were processed to produce these maps.

IV. Special Notes

1. An attempt was made to maintain a constant contour interval on each map; however, on some maps, intermediate contours were added to improve the clarity or pinpoint local maximum or minimum areas. Dashed lines were used whenever intermediate contour lines were drawn.

2. These maps, especially the average series, should not be used to estimate rainfall onto the surface of Lake Okeechobee. Rainfall data collected over the lake indicate that significantly less precipitation falls on the lake than on the nearby land area. These data are not of sufficient quality or duration to estimate long term averages and, therefore, were not included in this analysis.

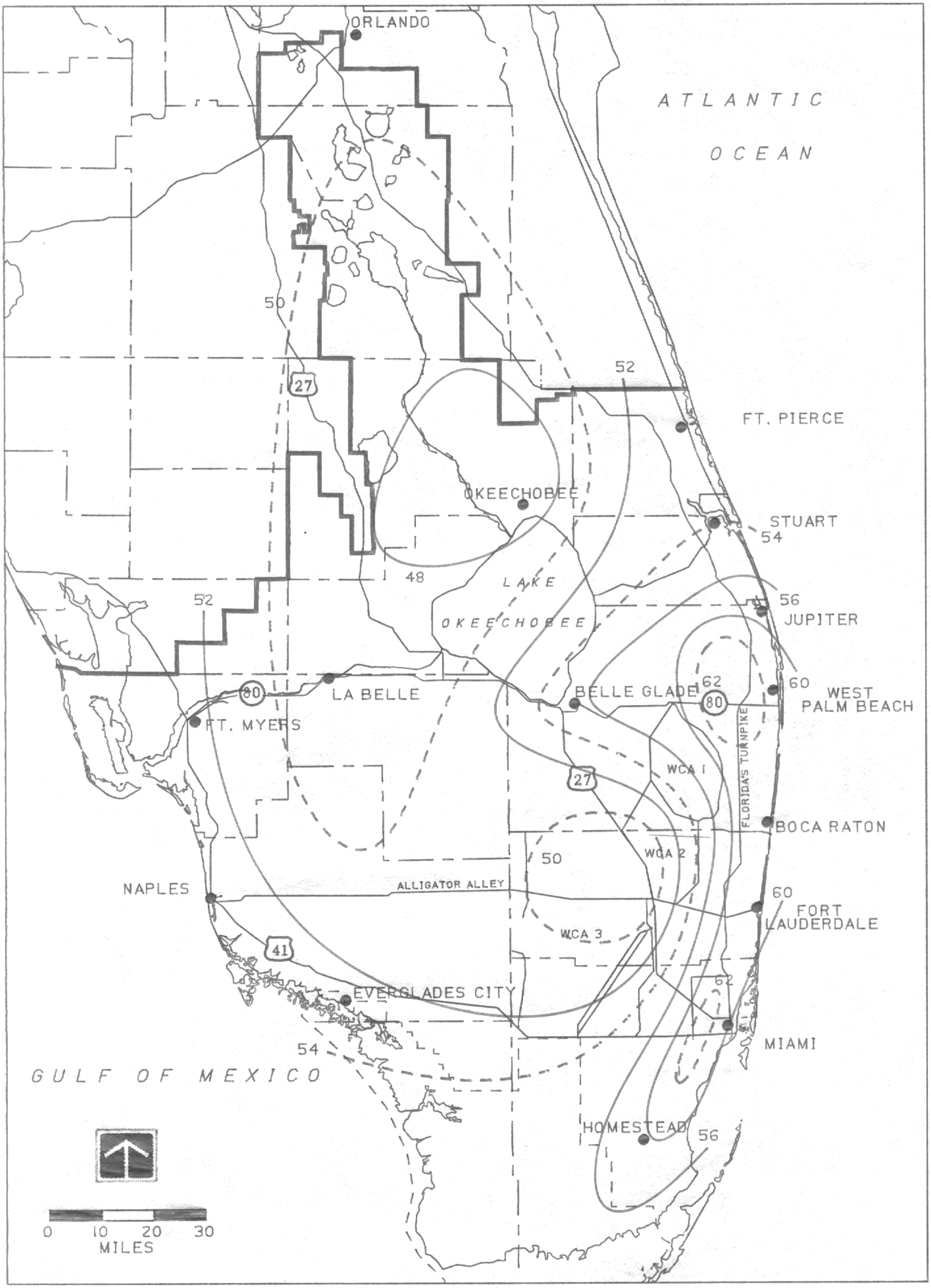

FIGURE 1. AVERAGE ANNUAL RAINFALL

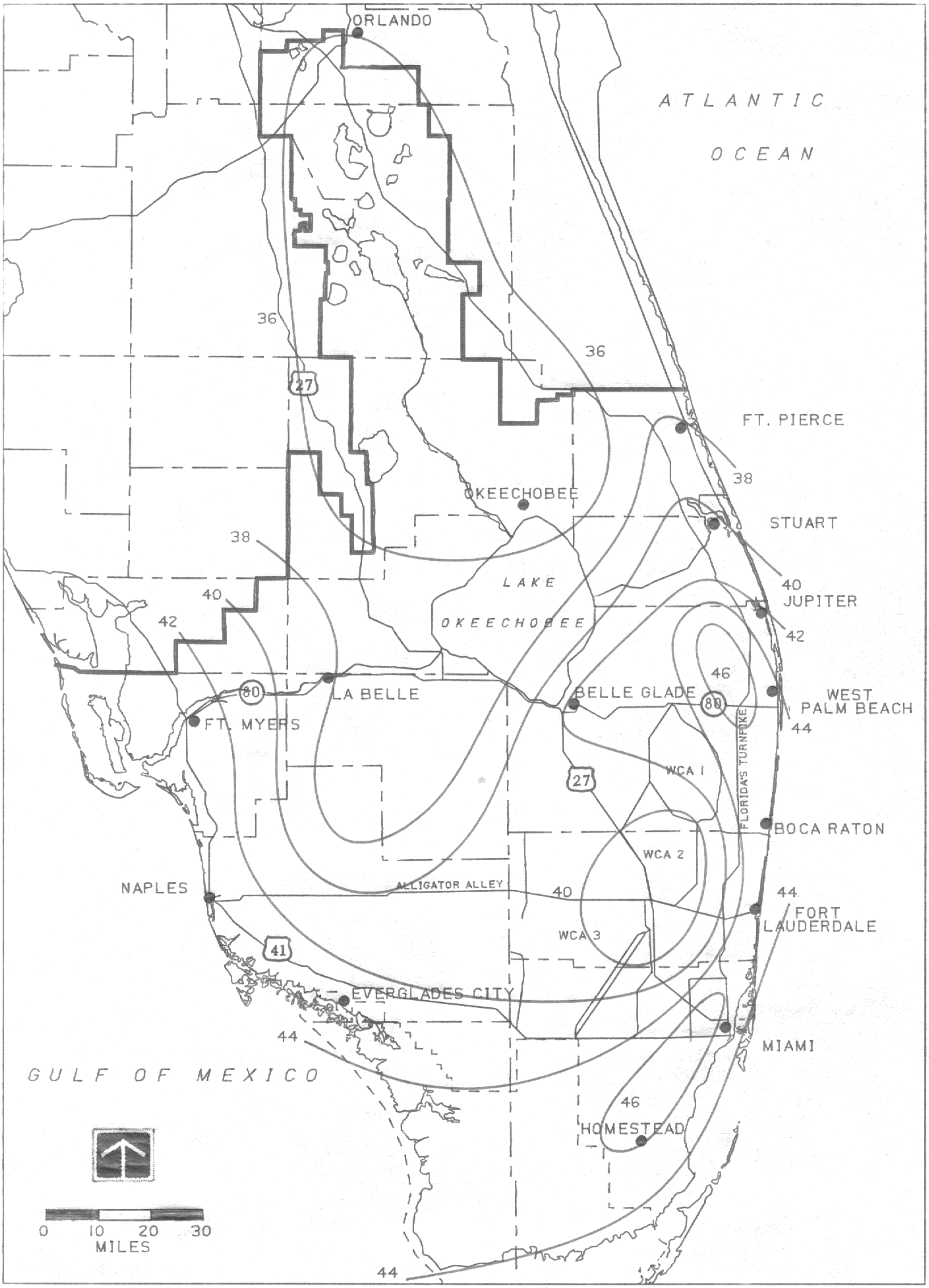

FIGURE 2. AVERAGE WET SEASON RAINFALL

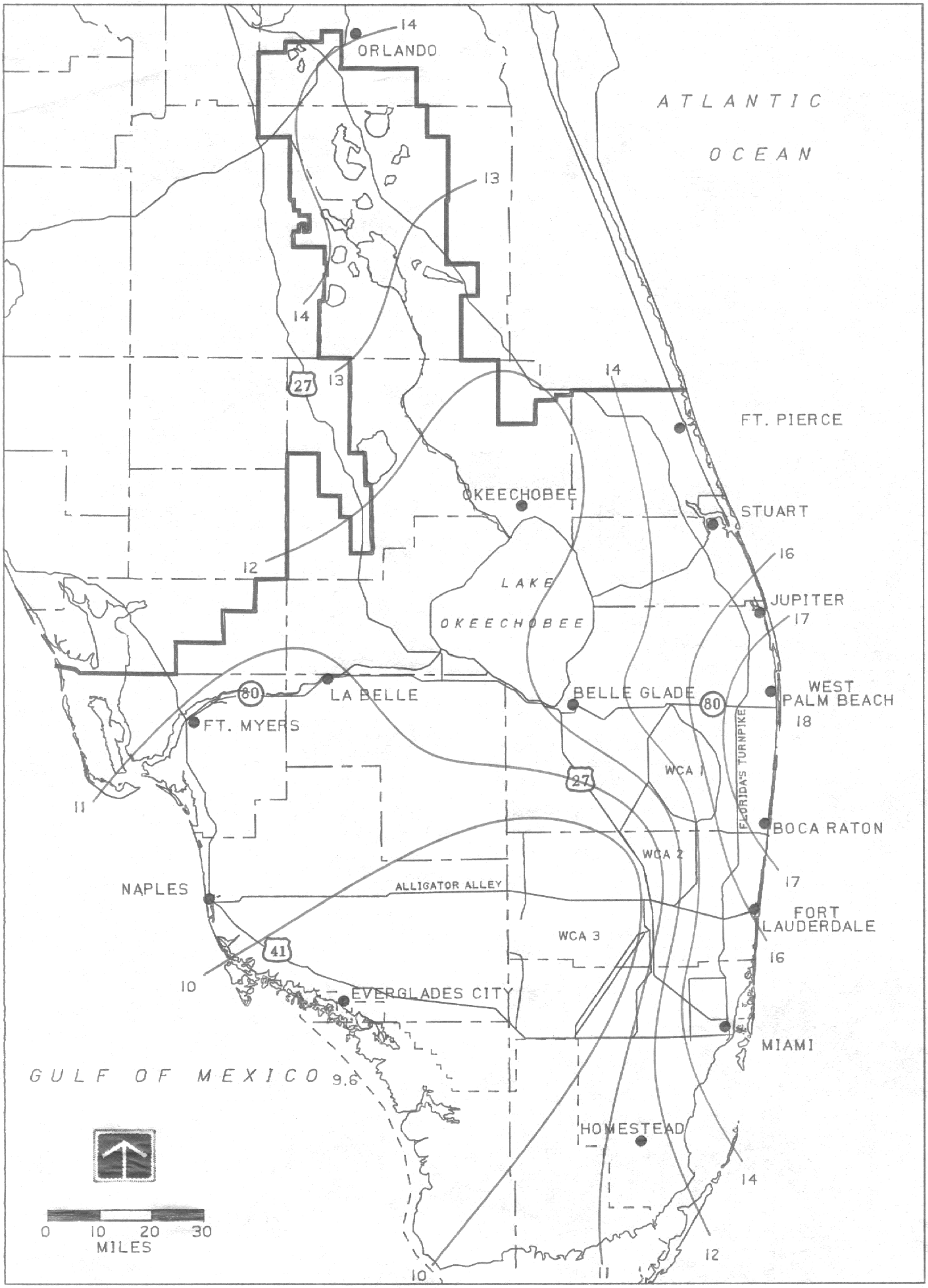

FIGURE 3. AVERAGE DRY SEASON RAINFALL

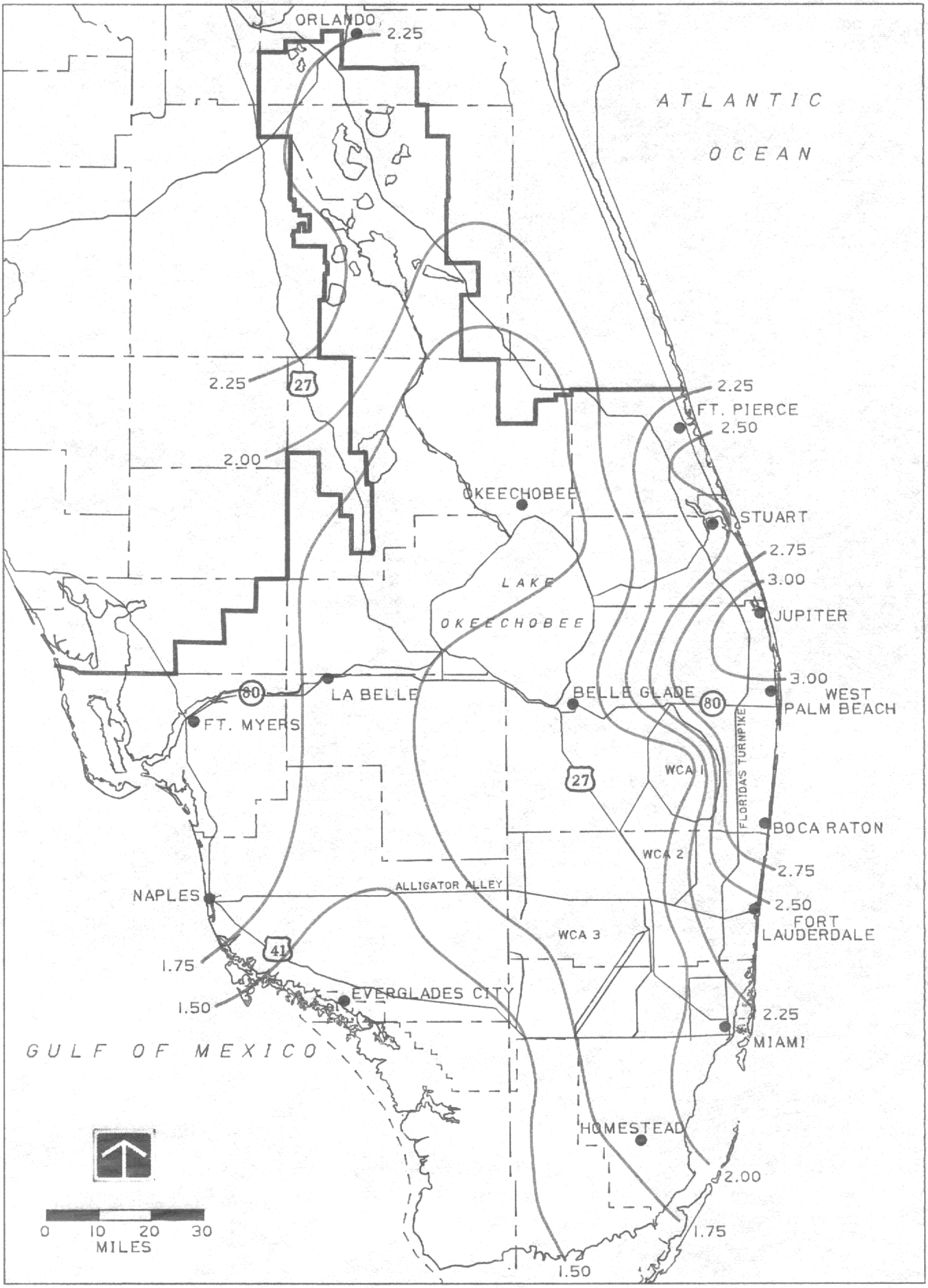

FIGURE 4. MONTHLY AVERAGE RAINFALL - JANUARY

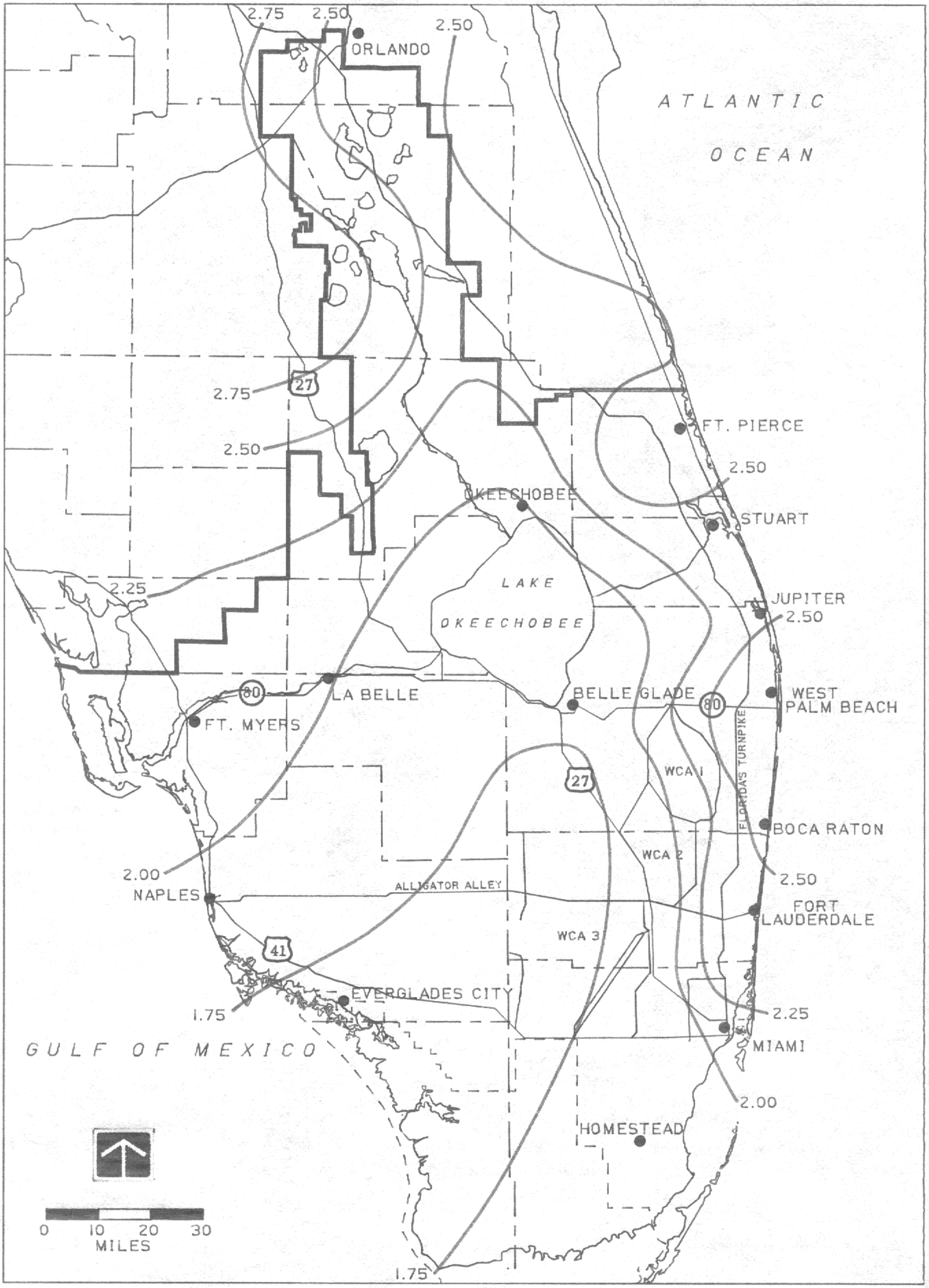

FIGURE 5. MONTHLY AVERAGE RAINFALL - FEBRUARY

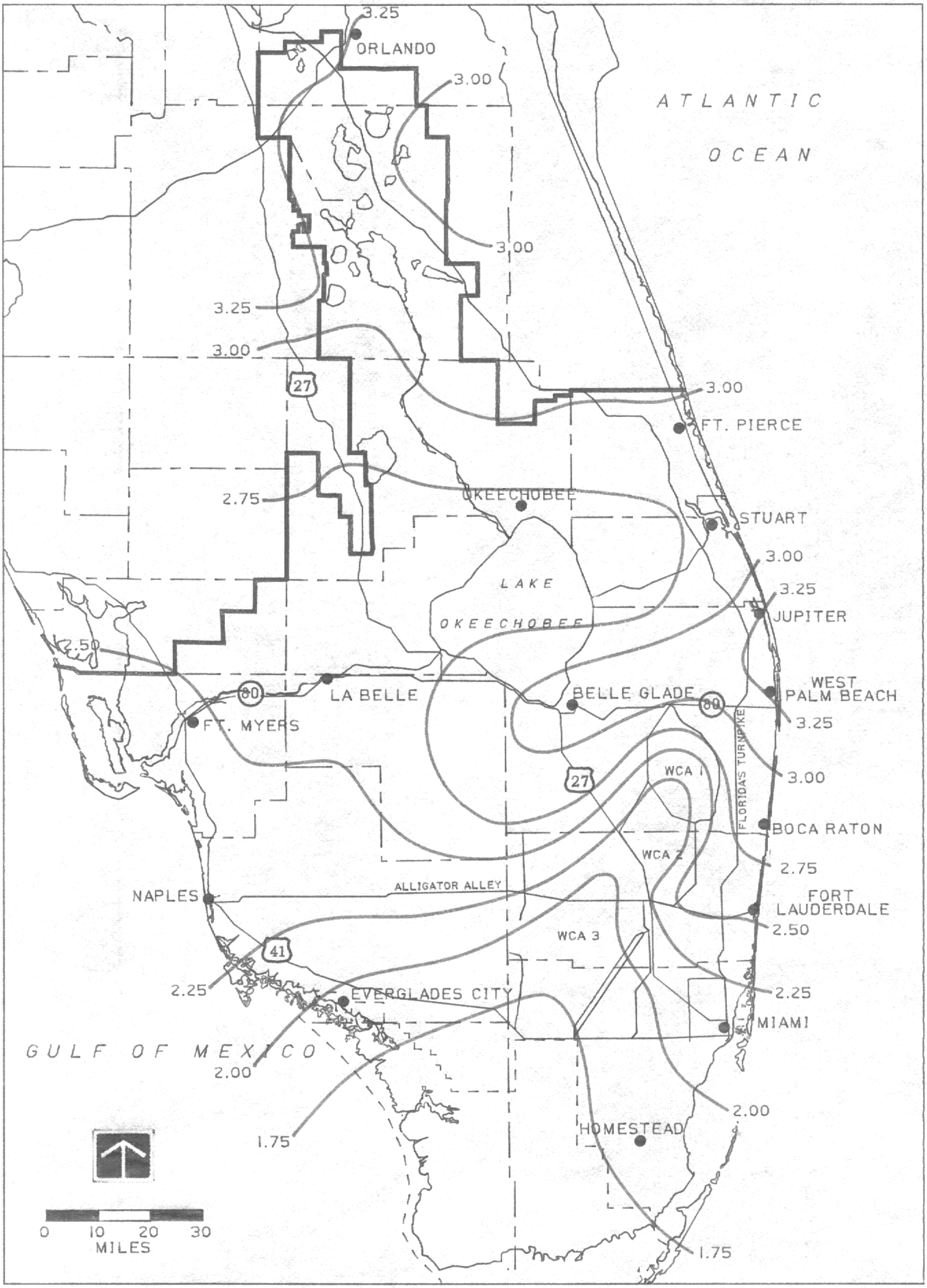

FIGURE 6. MONTHLY AVERAGE RAINFALL - MARCH

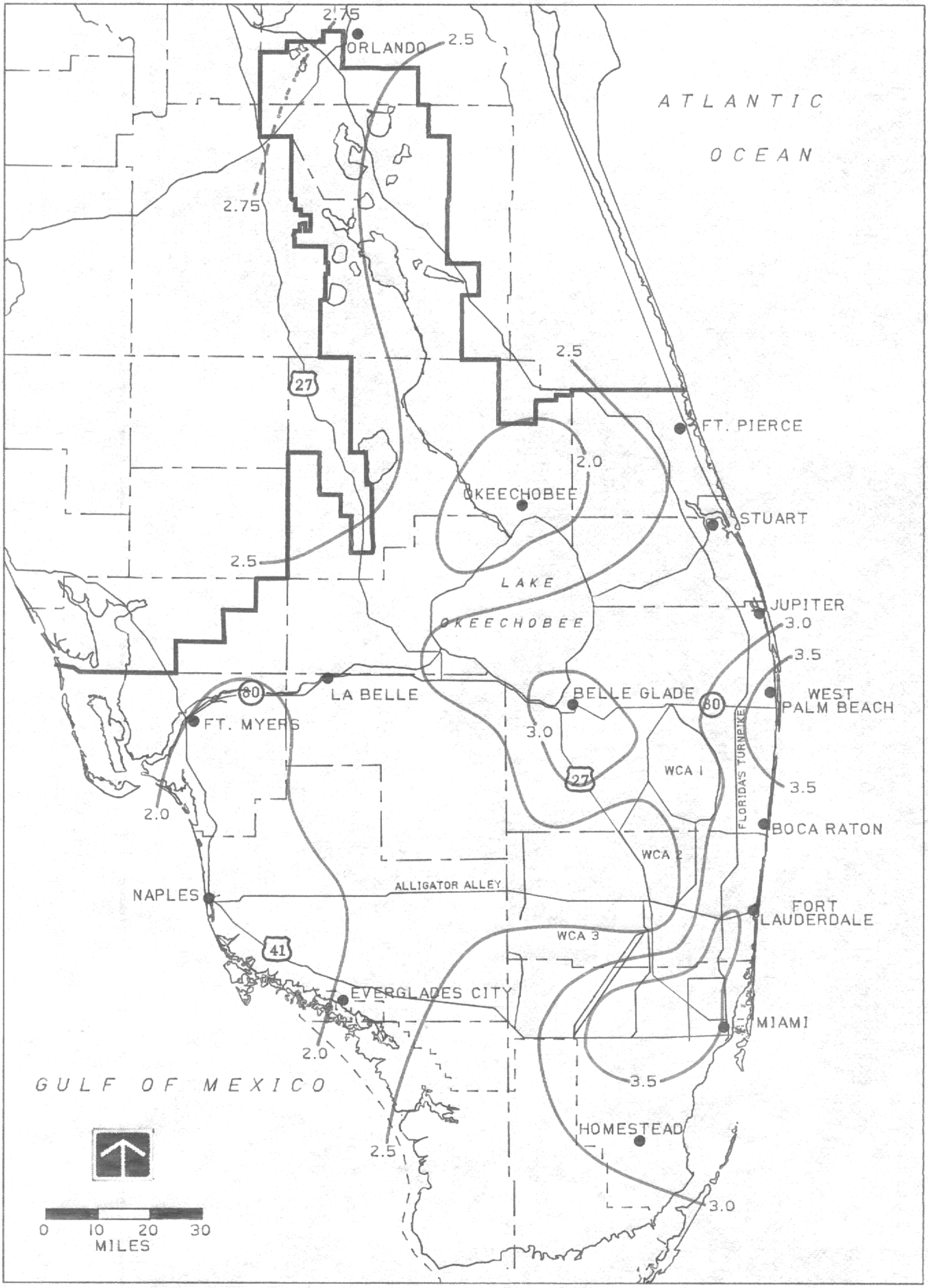

FIGURE 7. MONTHLY AVERAGE RAINFALL - APRIL

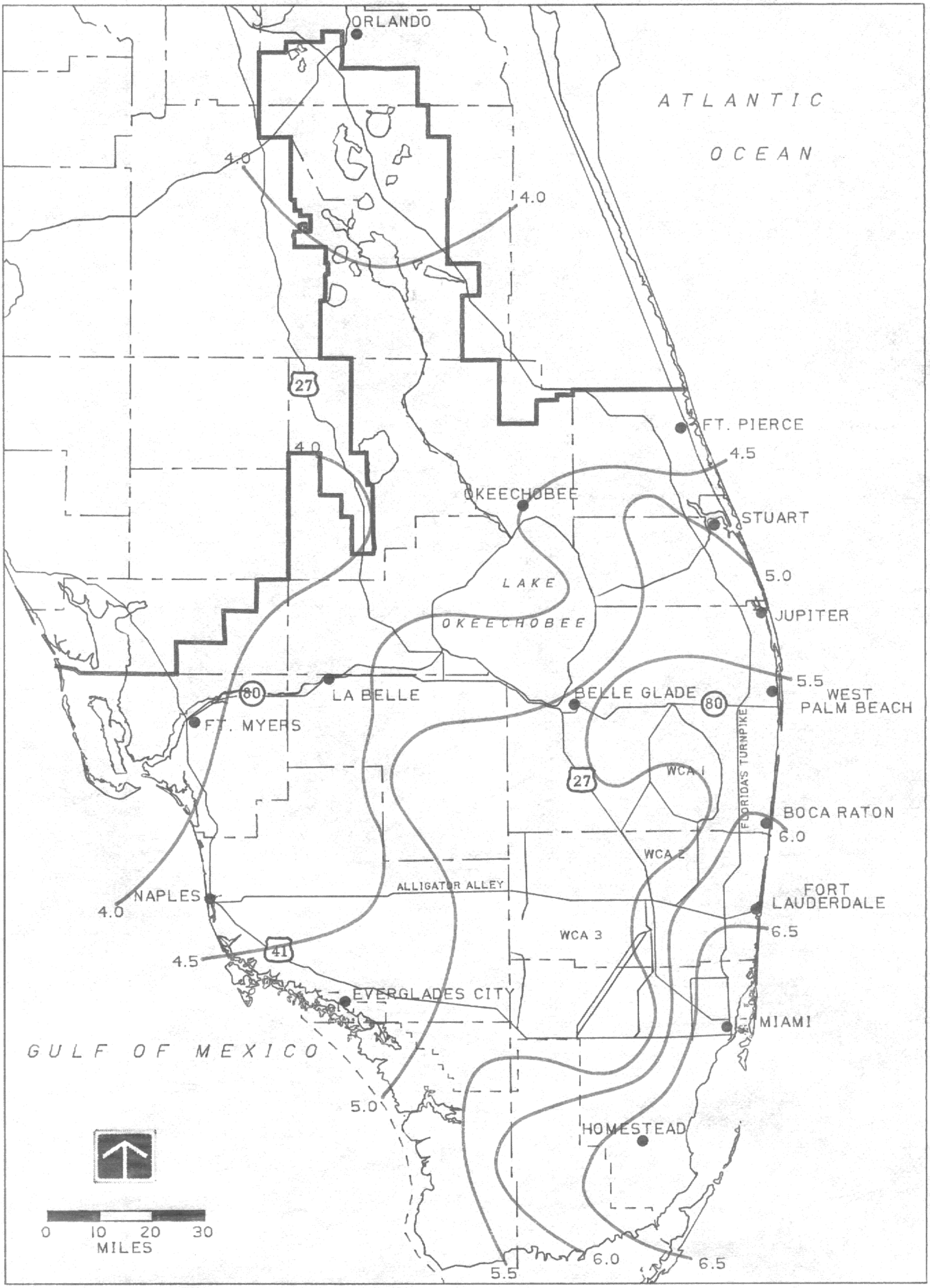

FIGURE 8. MONTHLY AVERAGE RAINFALL - MAY

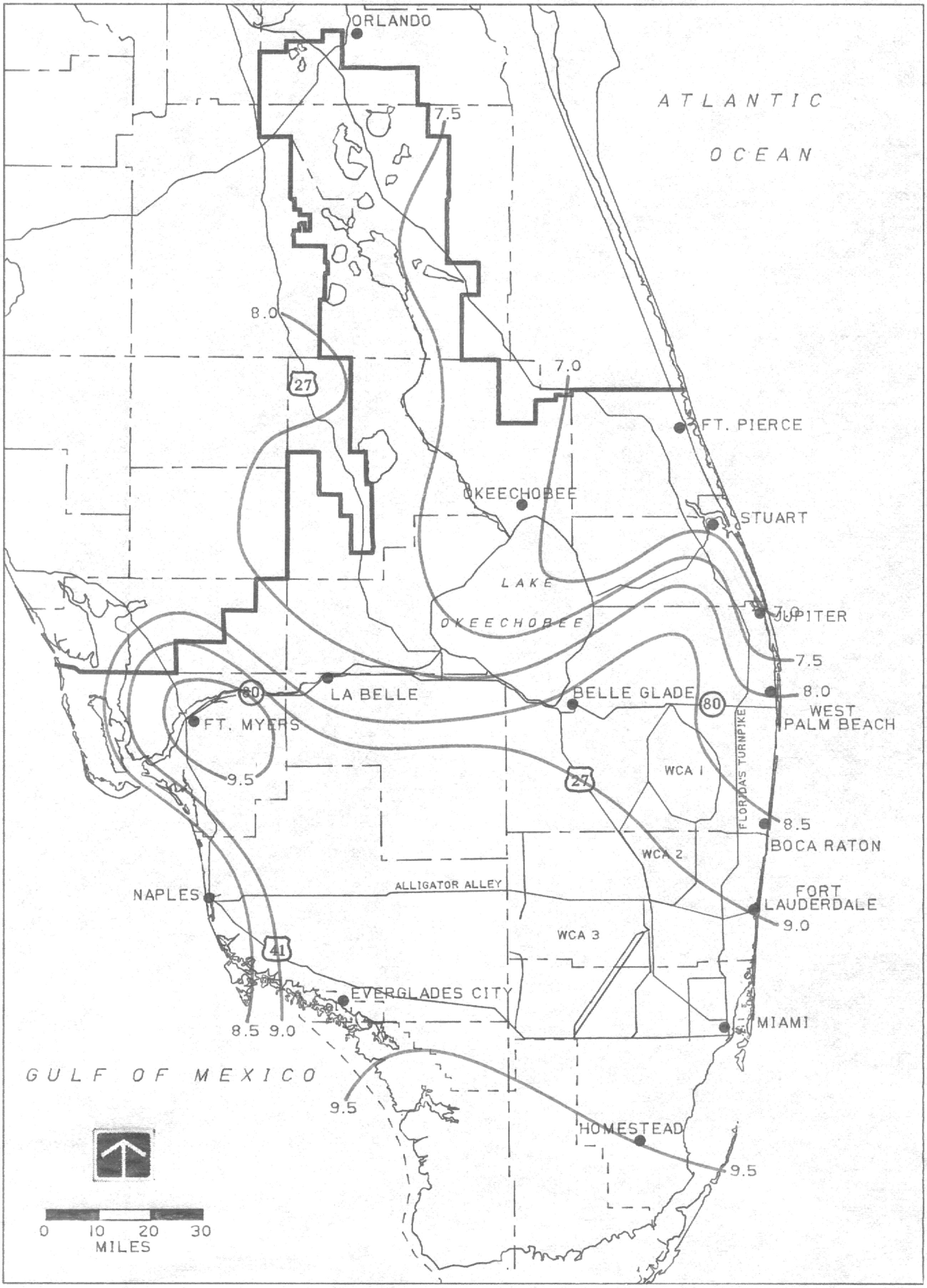

FIGURE 9. MONTHLY AVERAGE RAINFALL - JUNE

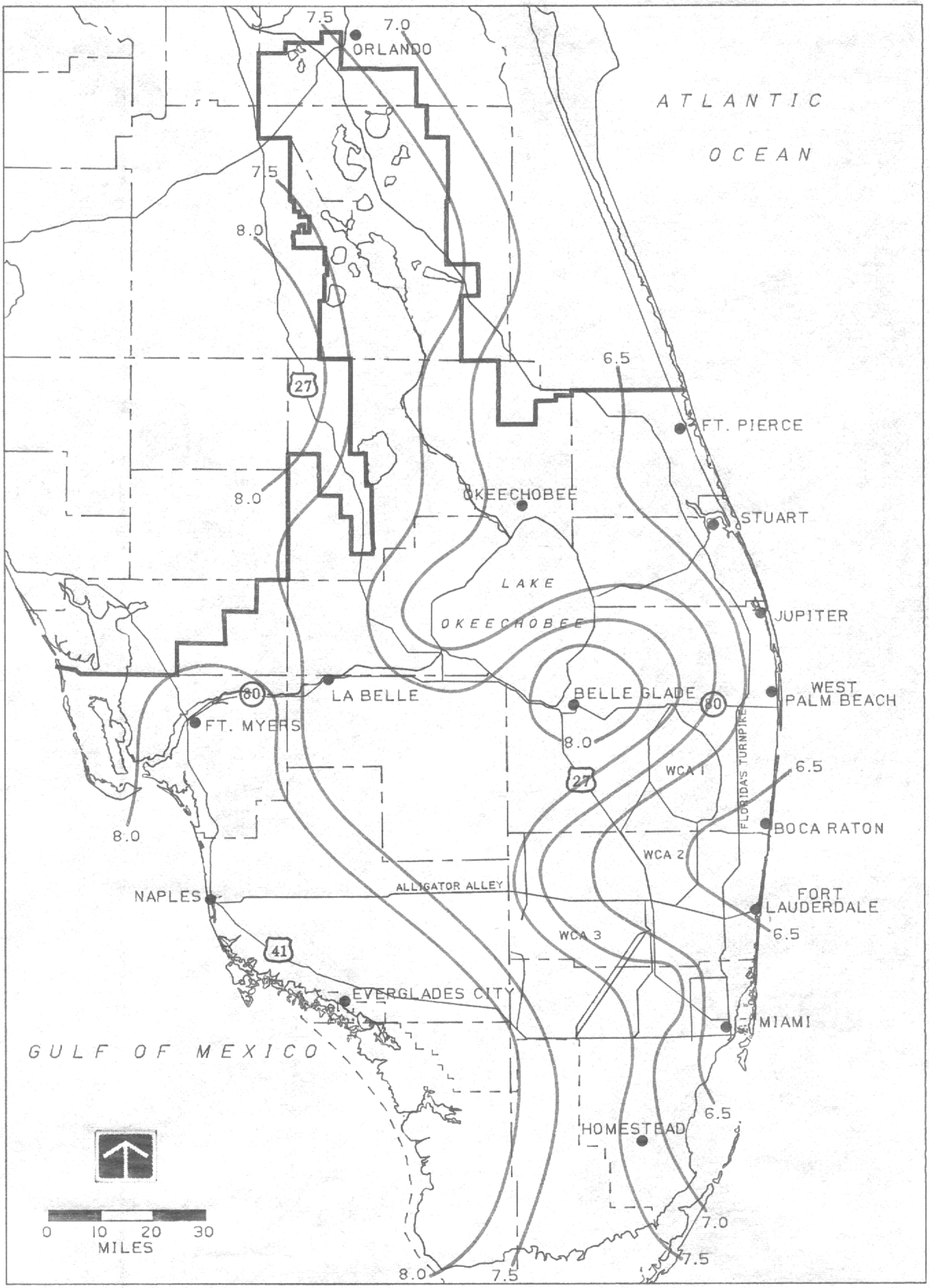

FIGURE 10. MONTHLY AVERAGE RAINFALL - JULY

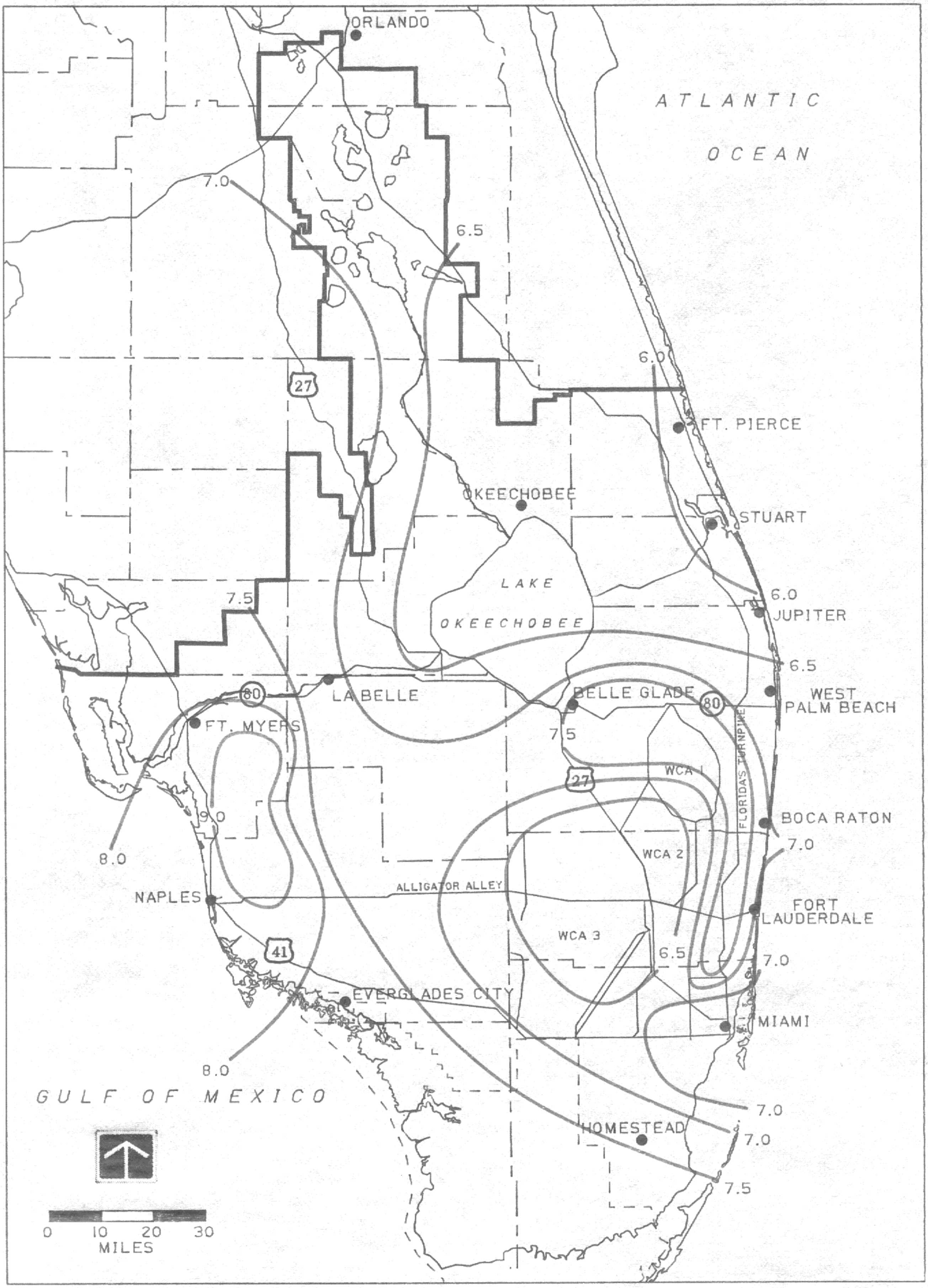

FIGURE 11. MONTHLY AVERAGE RAINFALL - AUGUST

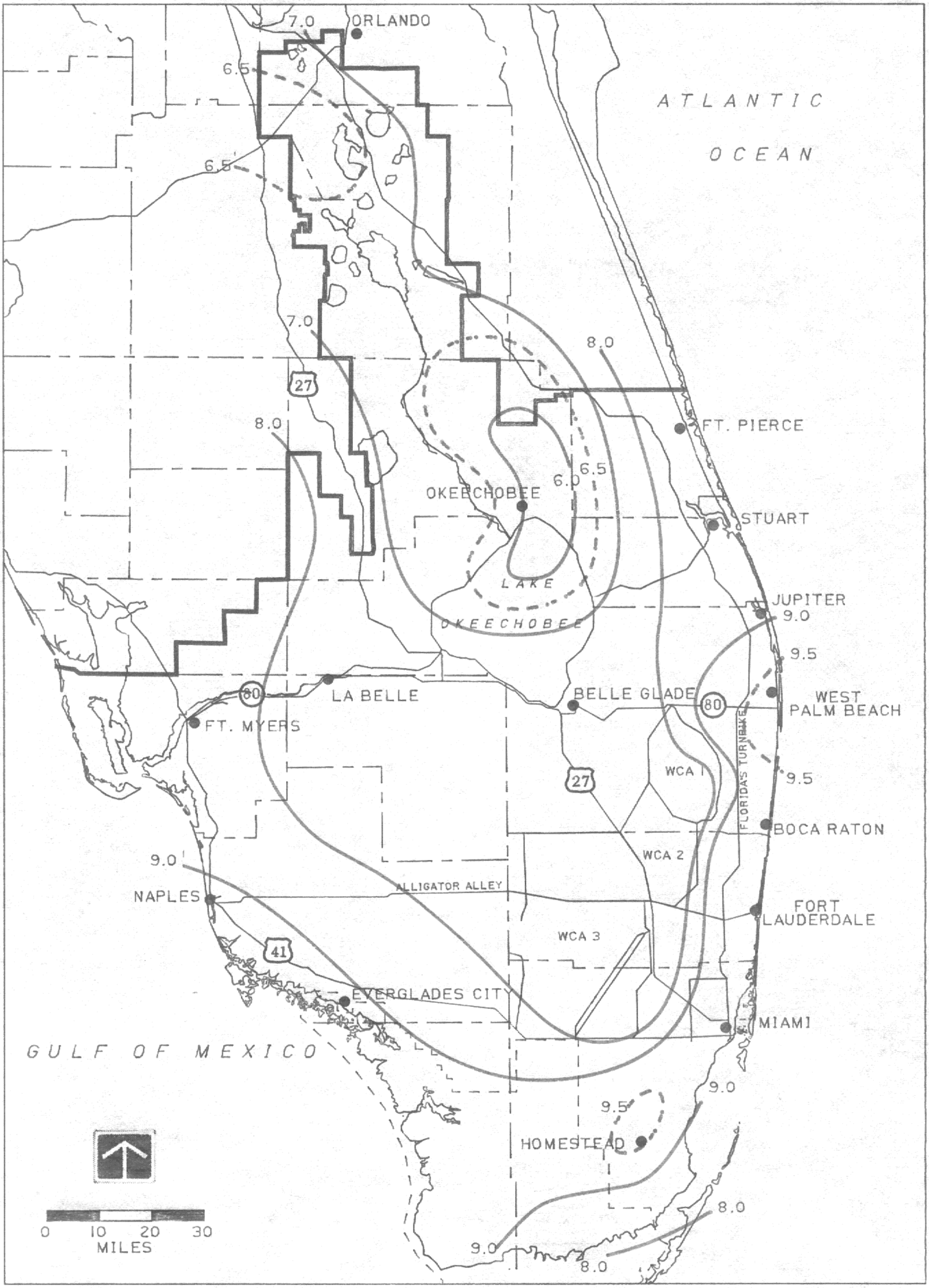

FIGURE 12. MONTHLY AVERAGE RAINFALL - SEPTEMBER

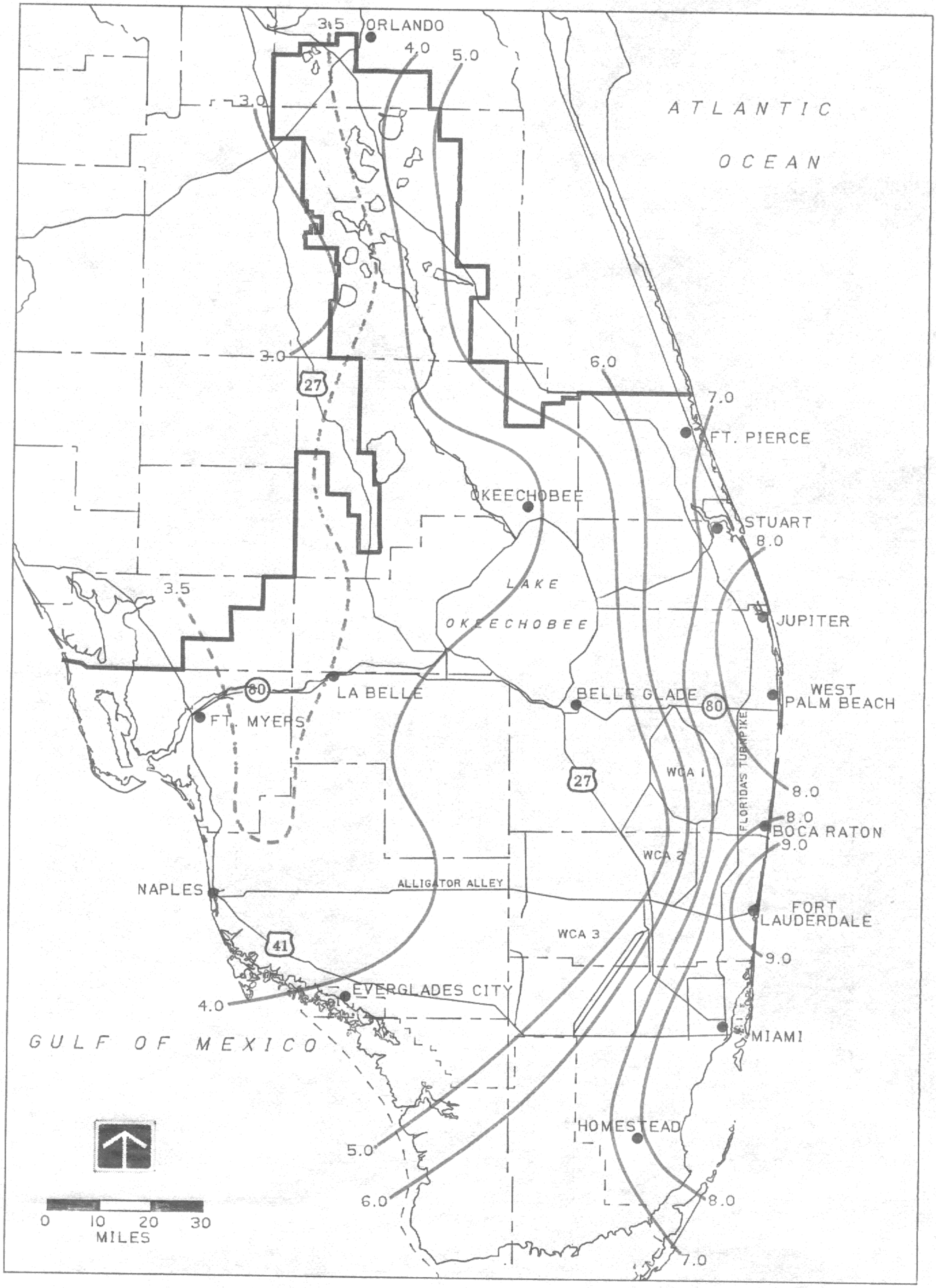

FIGURE 13. MONTHLY AVERAGE RAINFALL - OCTOBER

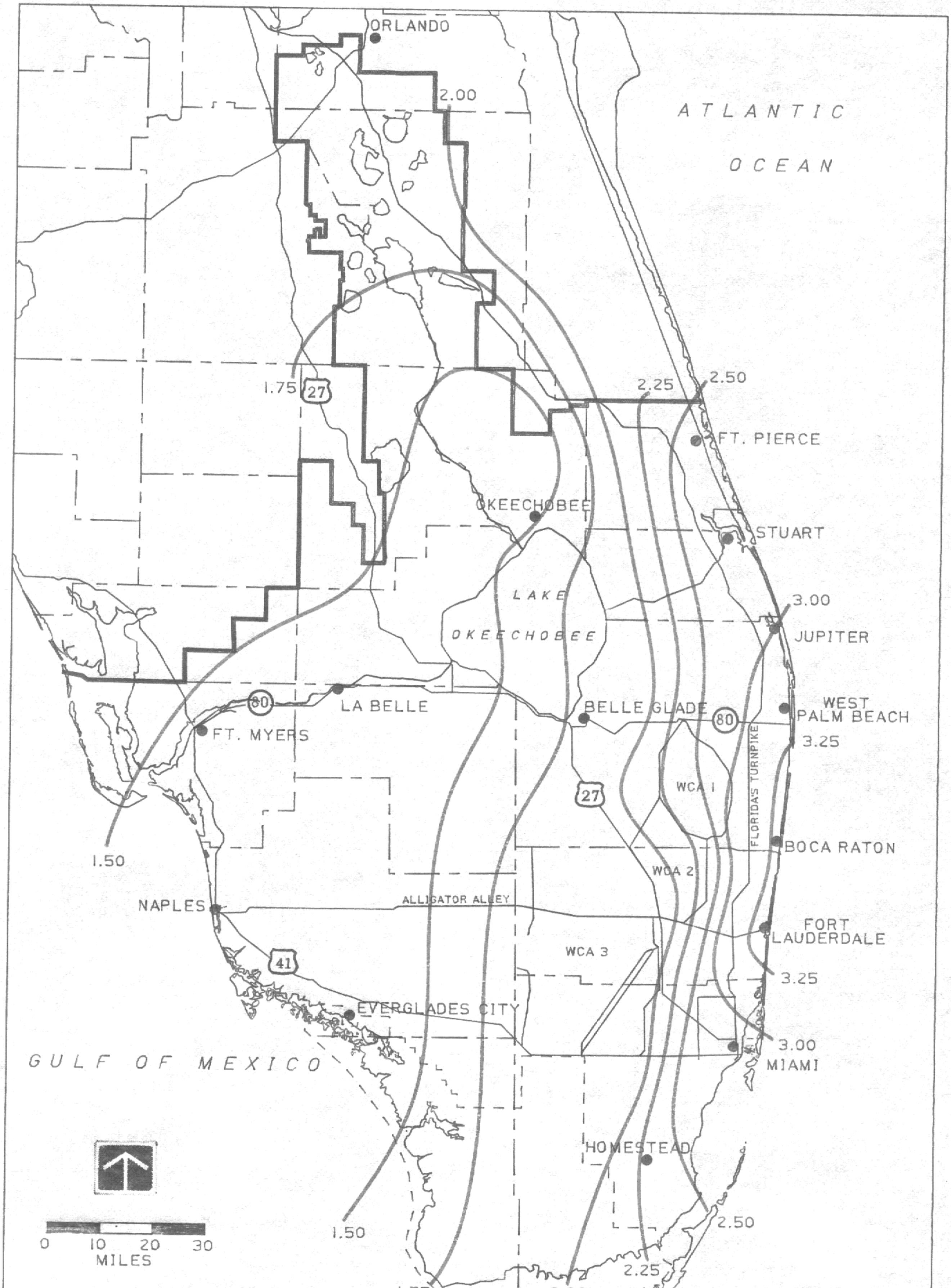

FIGURE 14. MONTHLY AVERAGE RAINFALL - NOVEMBER

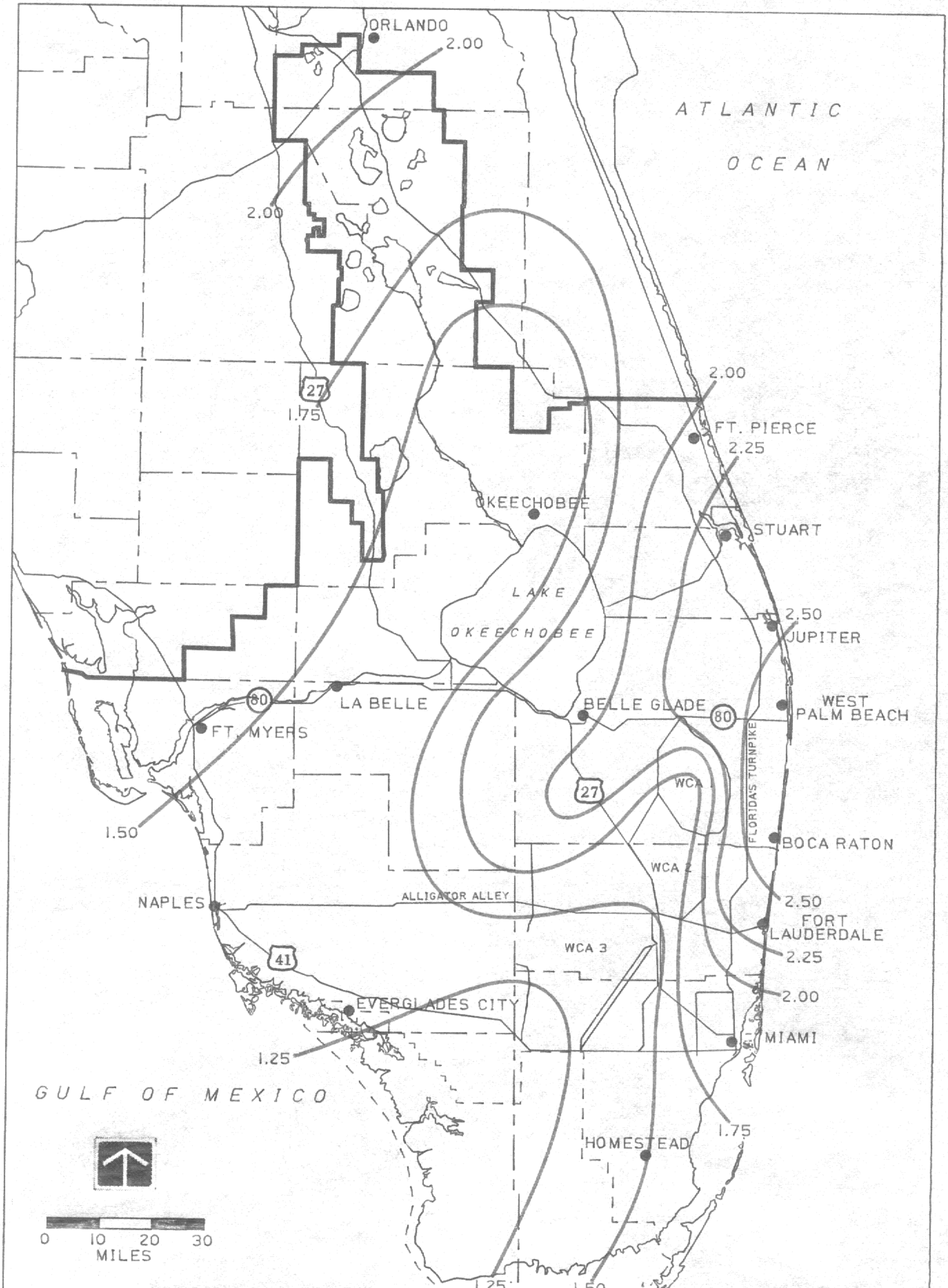

FIGURE 15. MONTHLY AVERAGE RAINFALL - DECEMBER

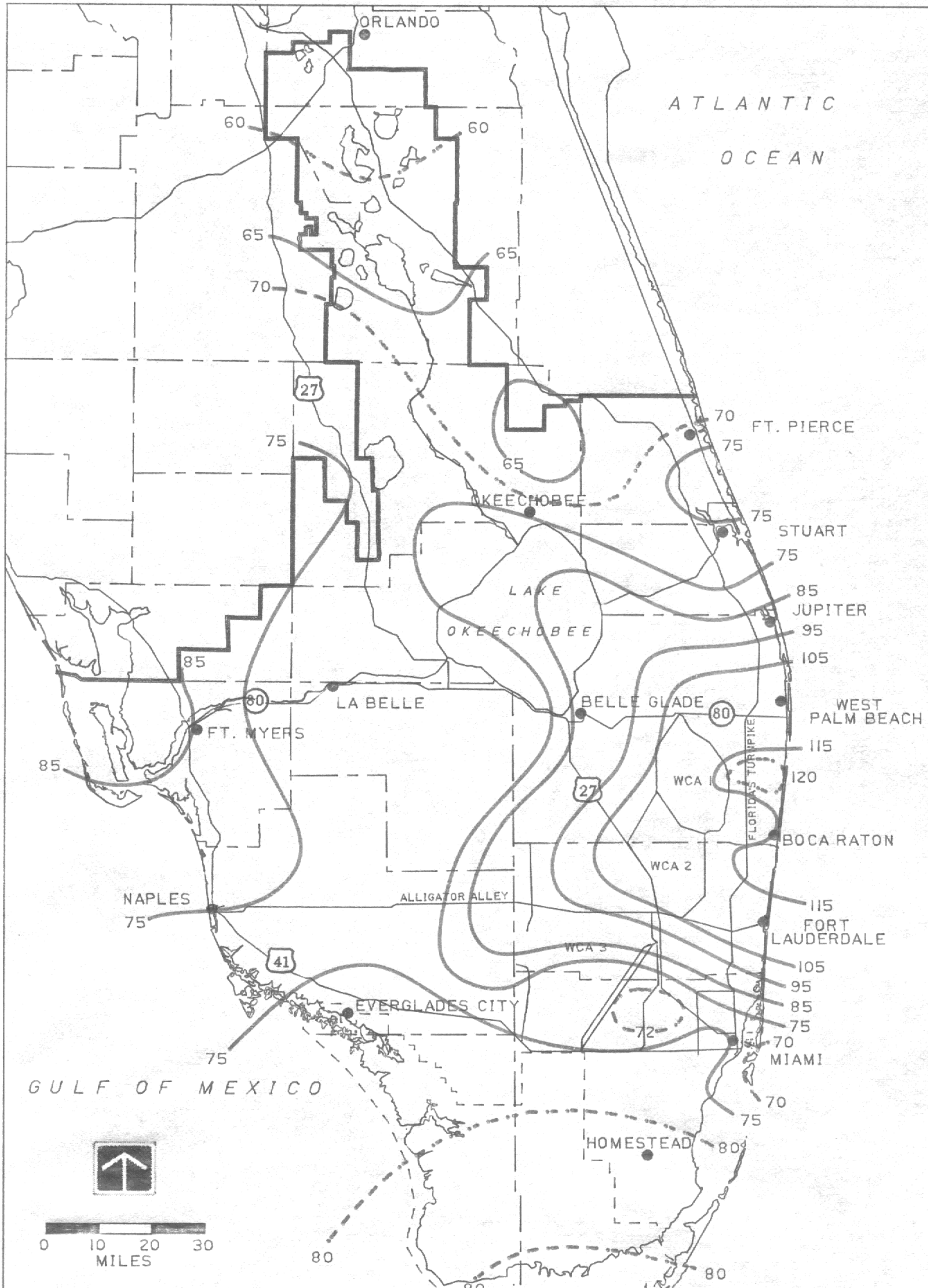

FIGURE 16. 1947 ANNUAL RAINFALL

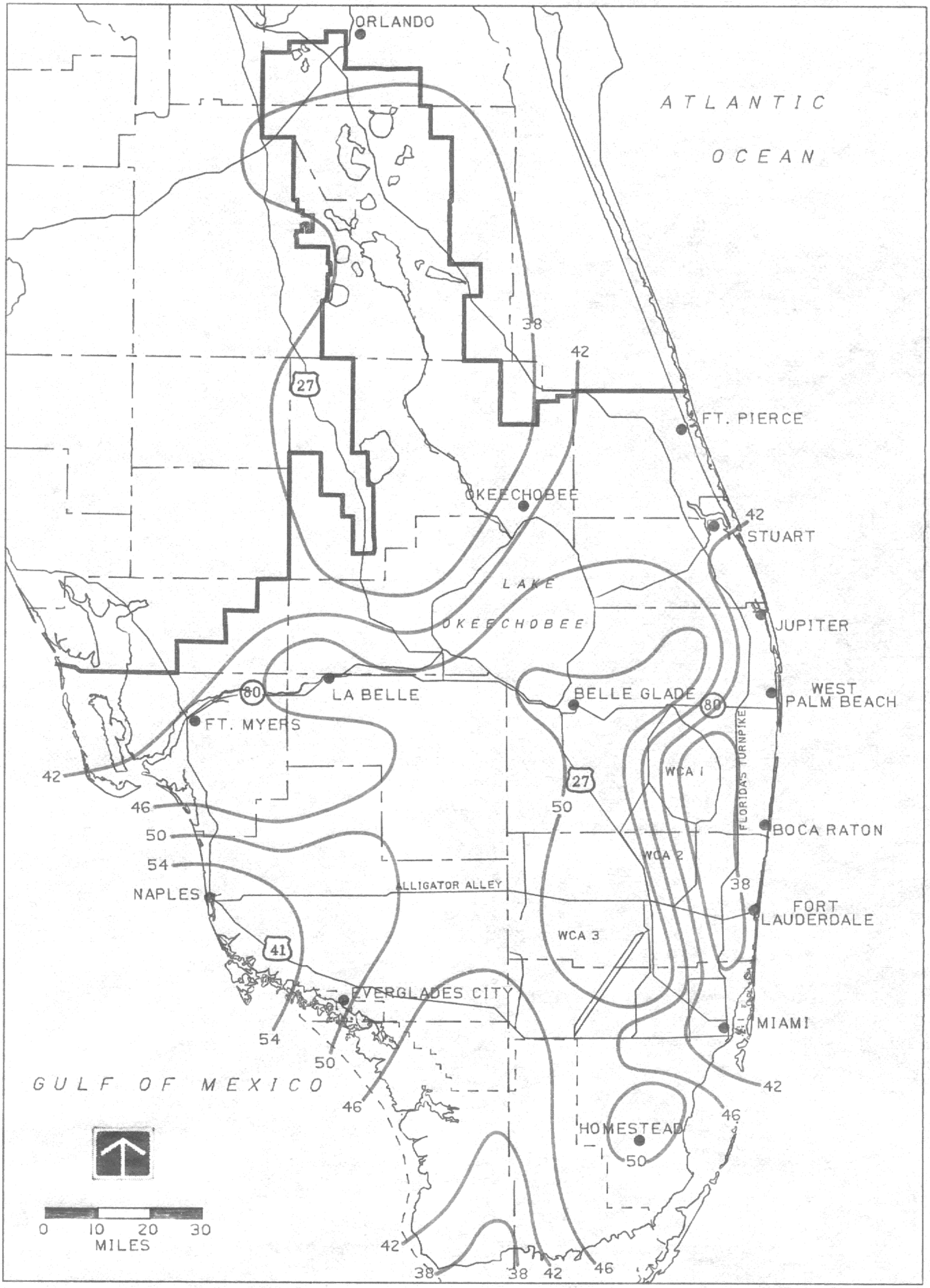

FIGURE 17. 1955 ANNUAL RAINFALL

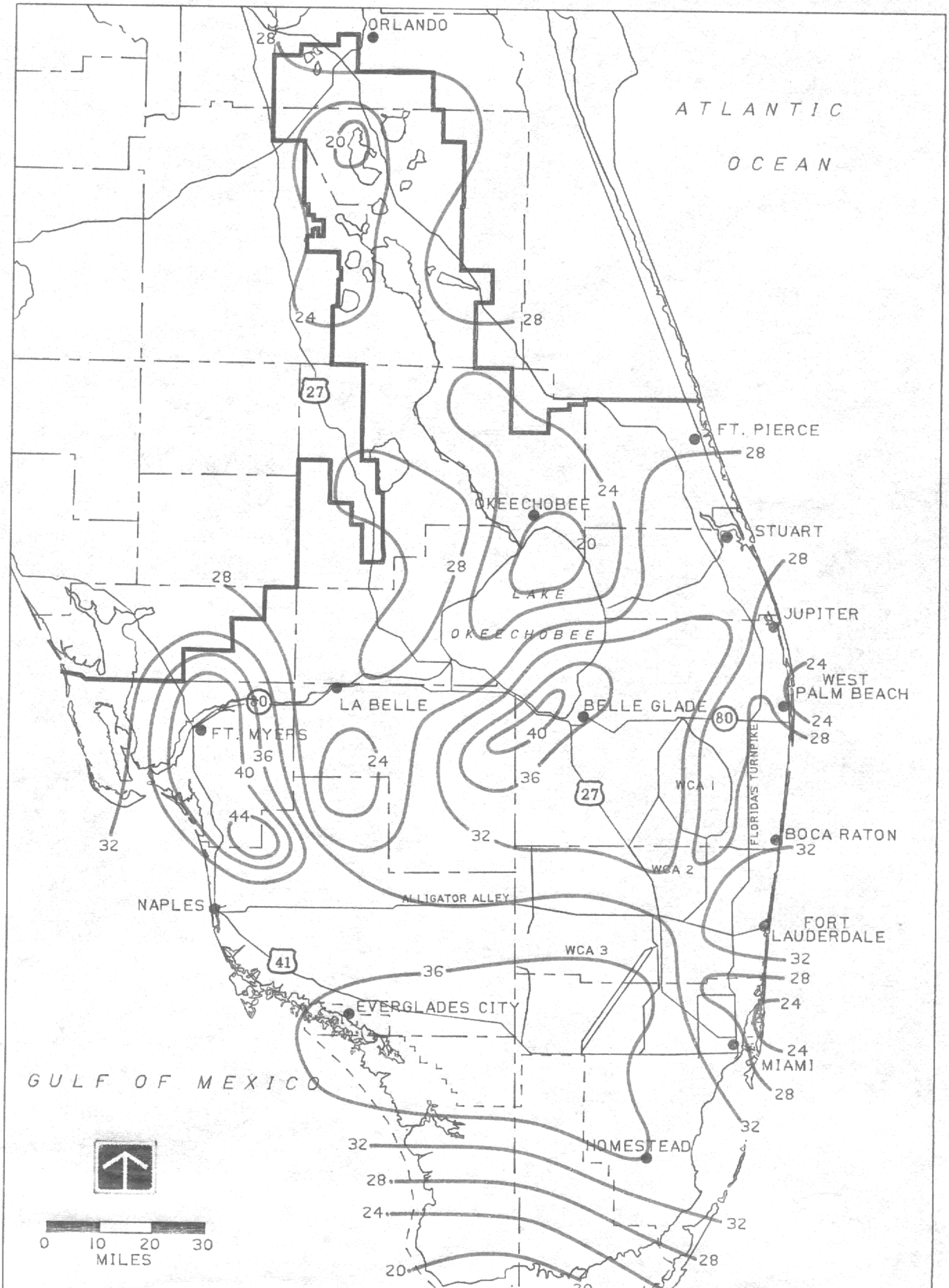

FIGURE 18. 1961 WET SEASON

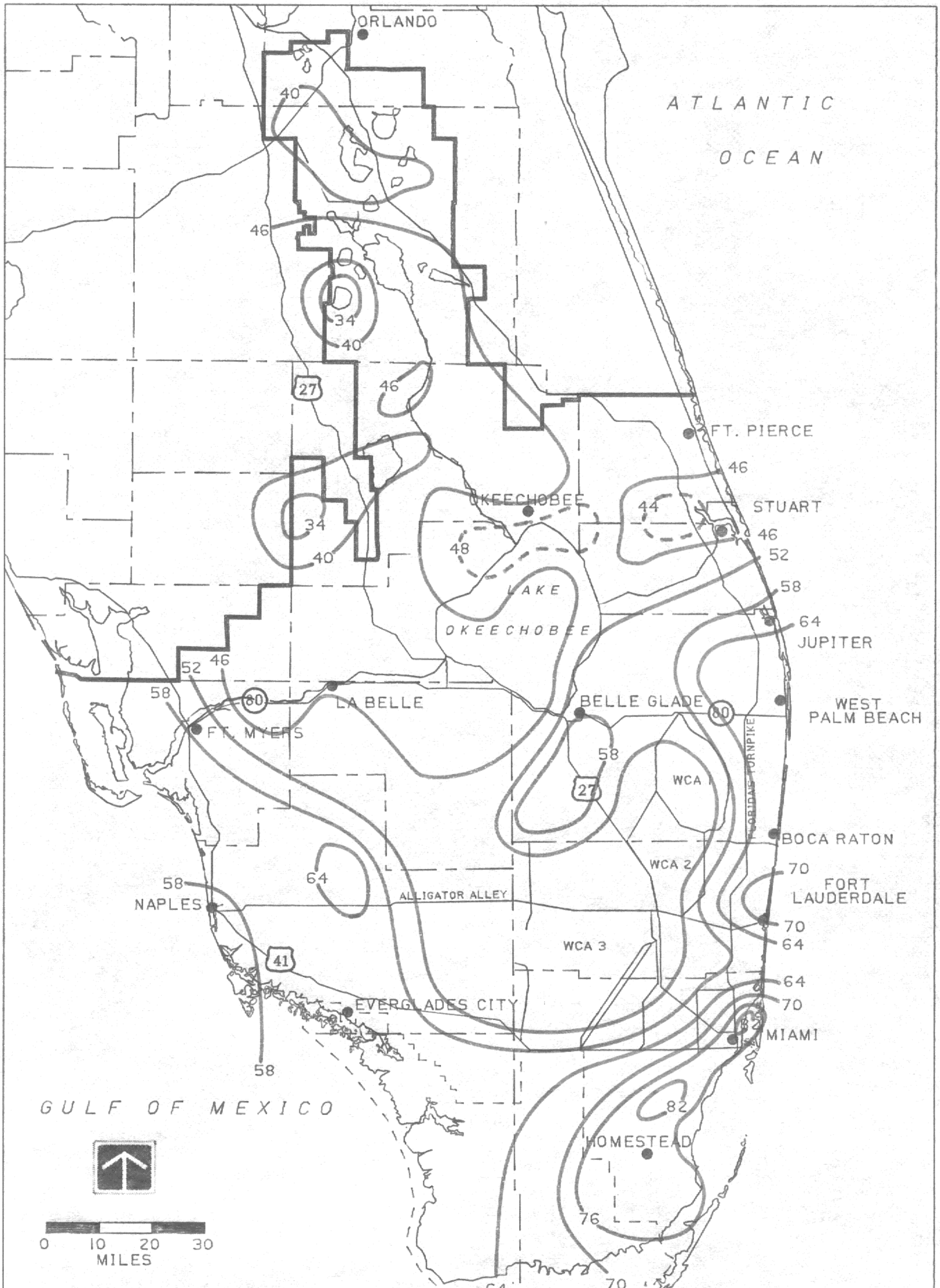

FIGURE 19. 1968 WET SEASON

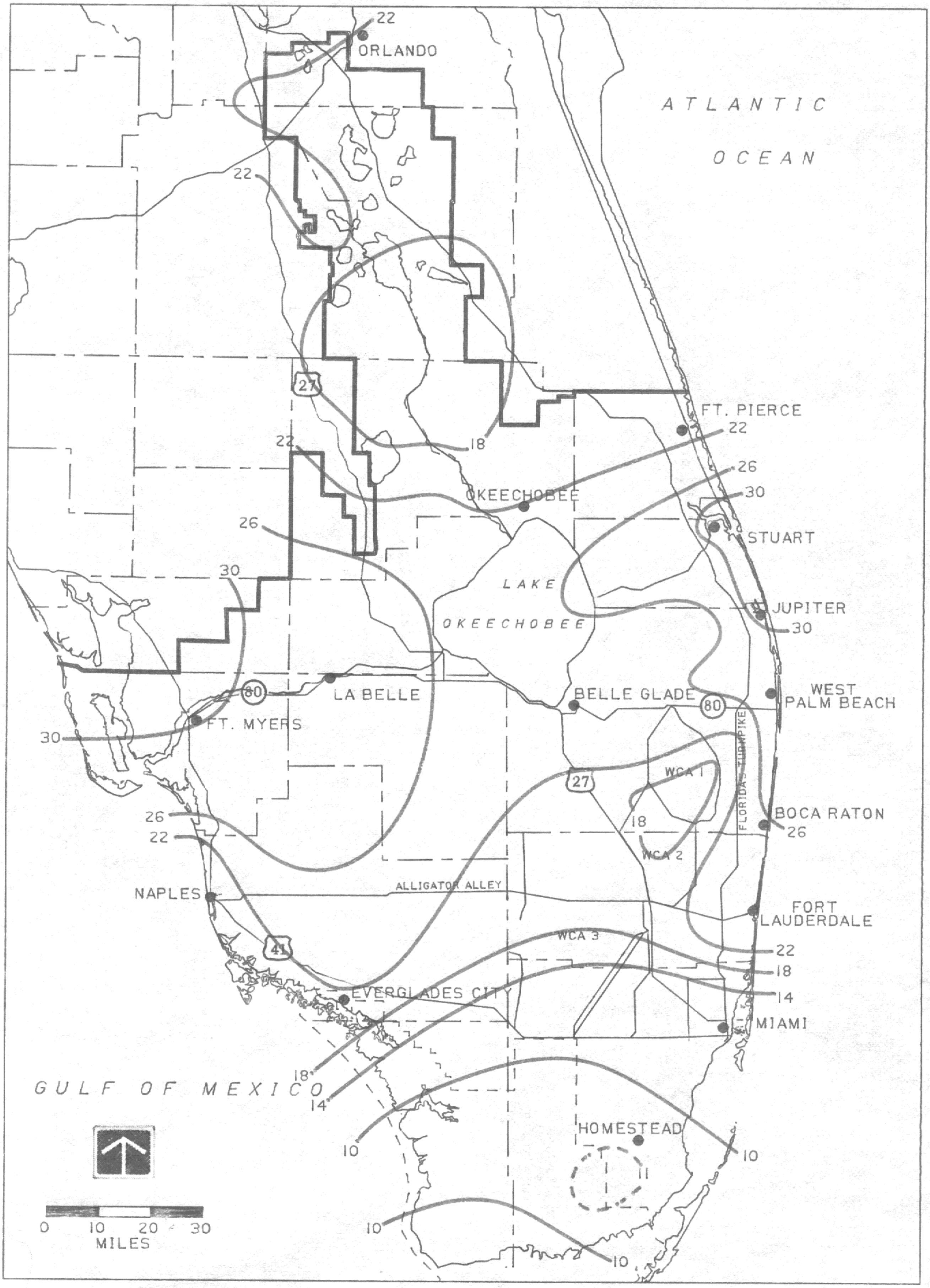

FIGURE 20. 1969-1970 DRY SEASON

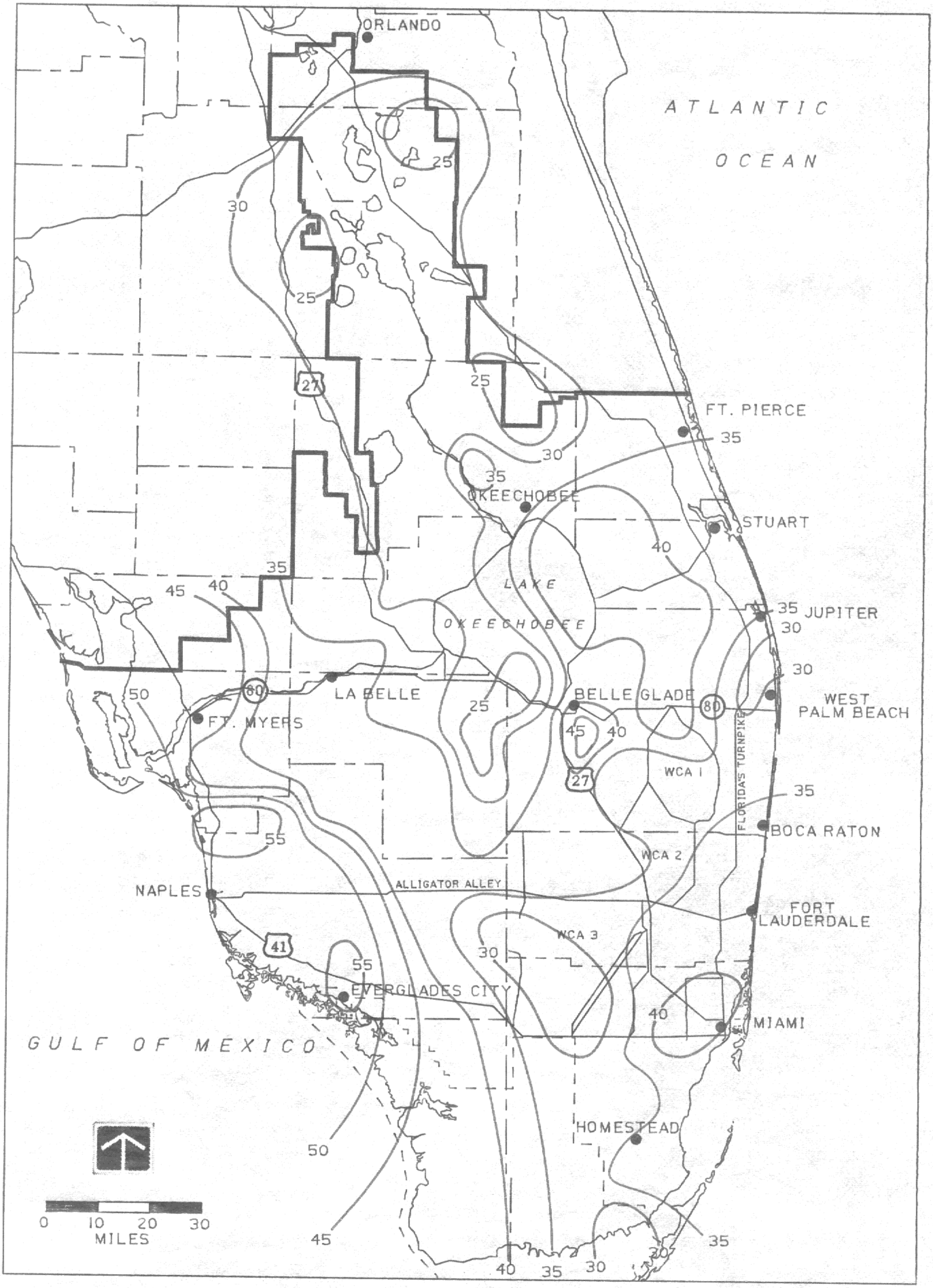

FIGURE 21. 1970 WET SEASON

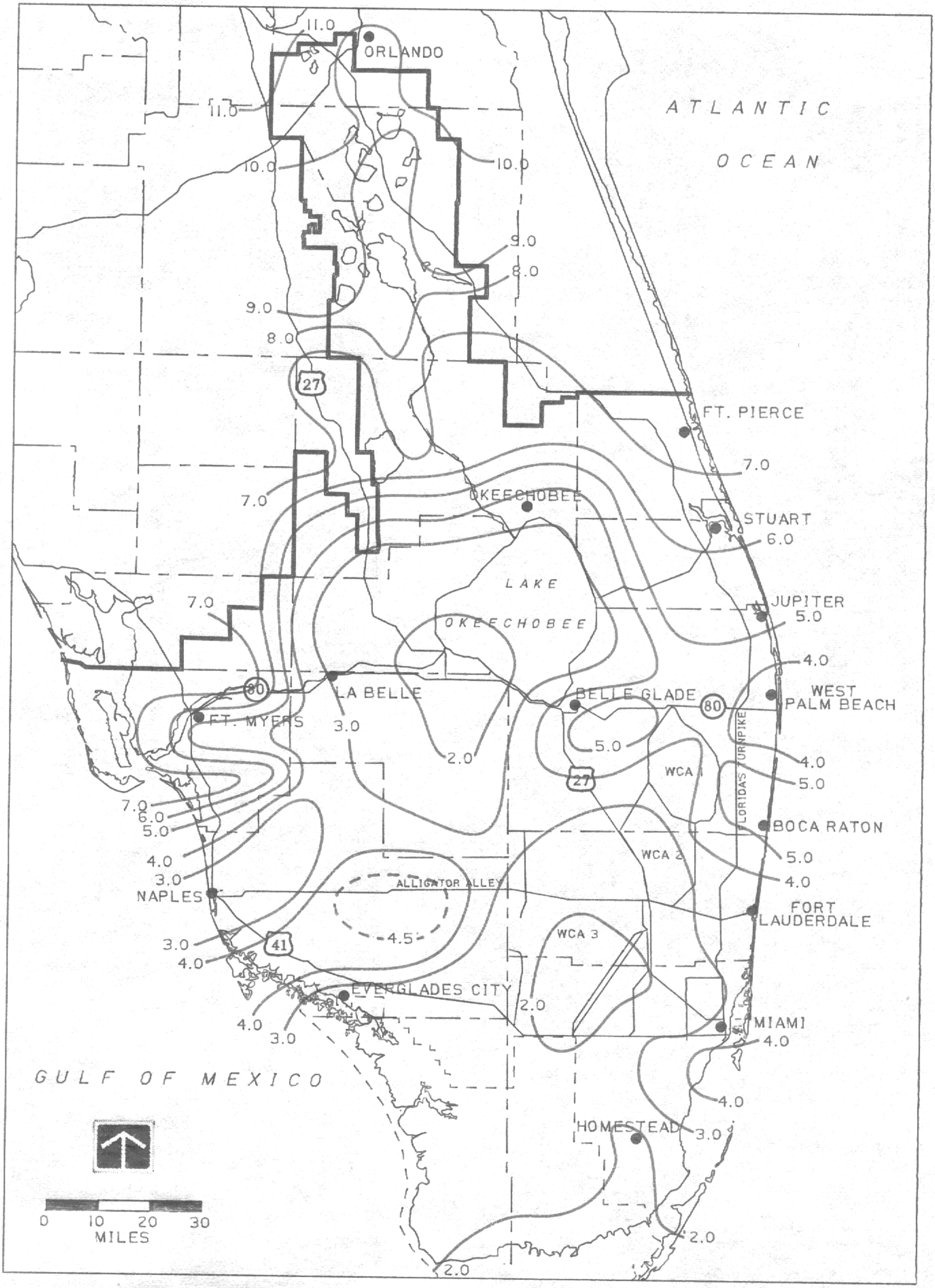

FIGURE 22. 1970-1971 DRY SEASON

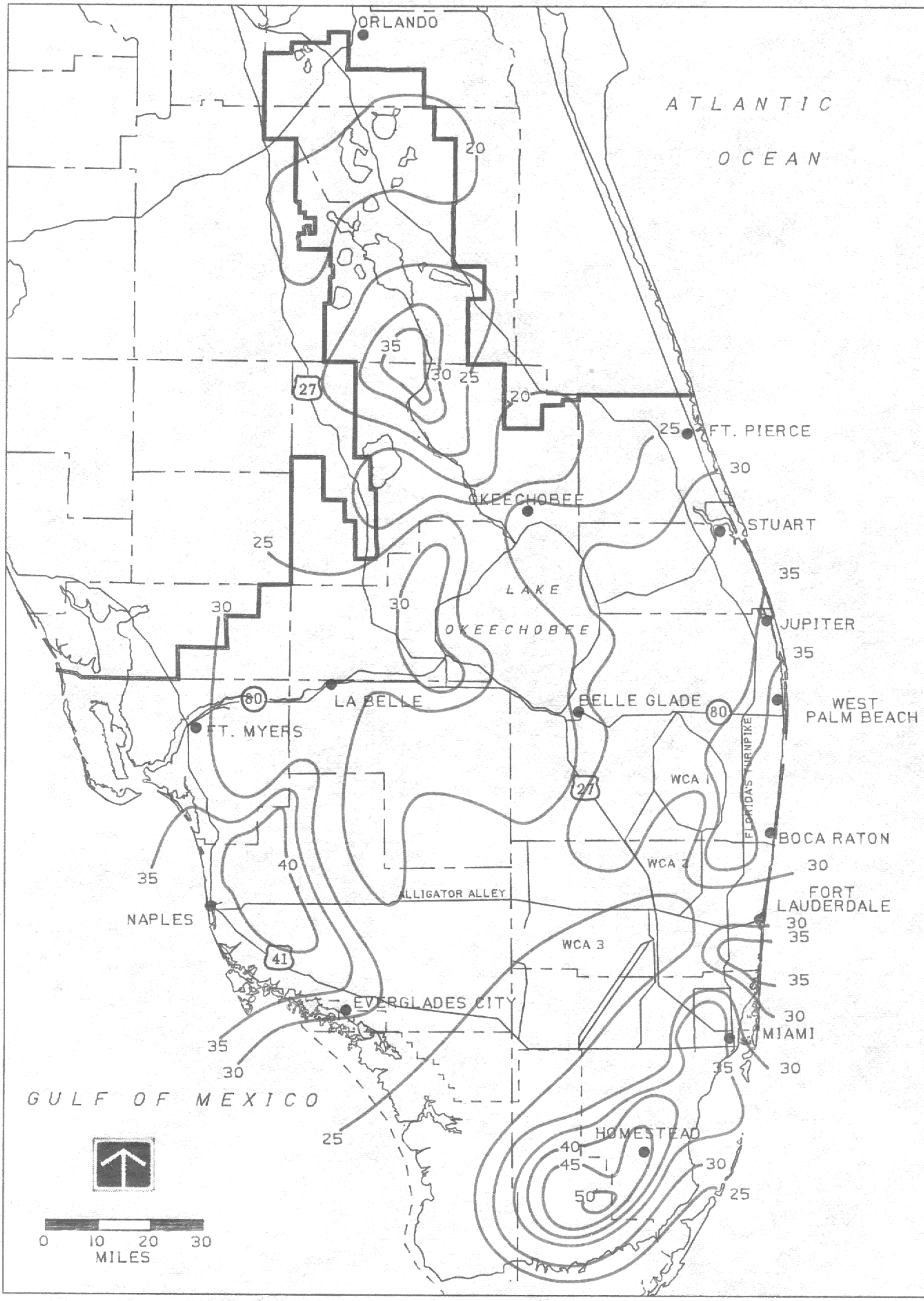

FIGURE 23. 1980 WET SEASON

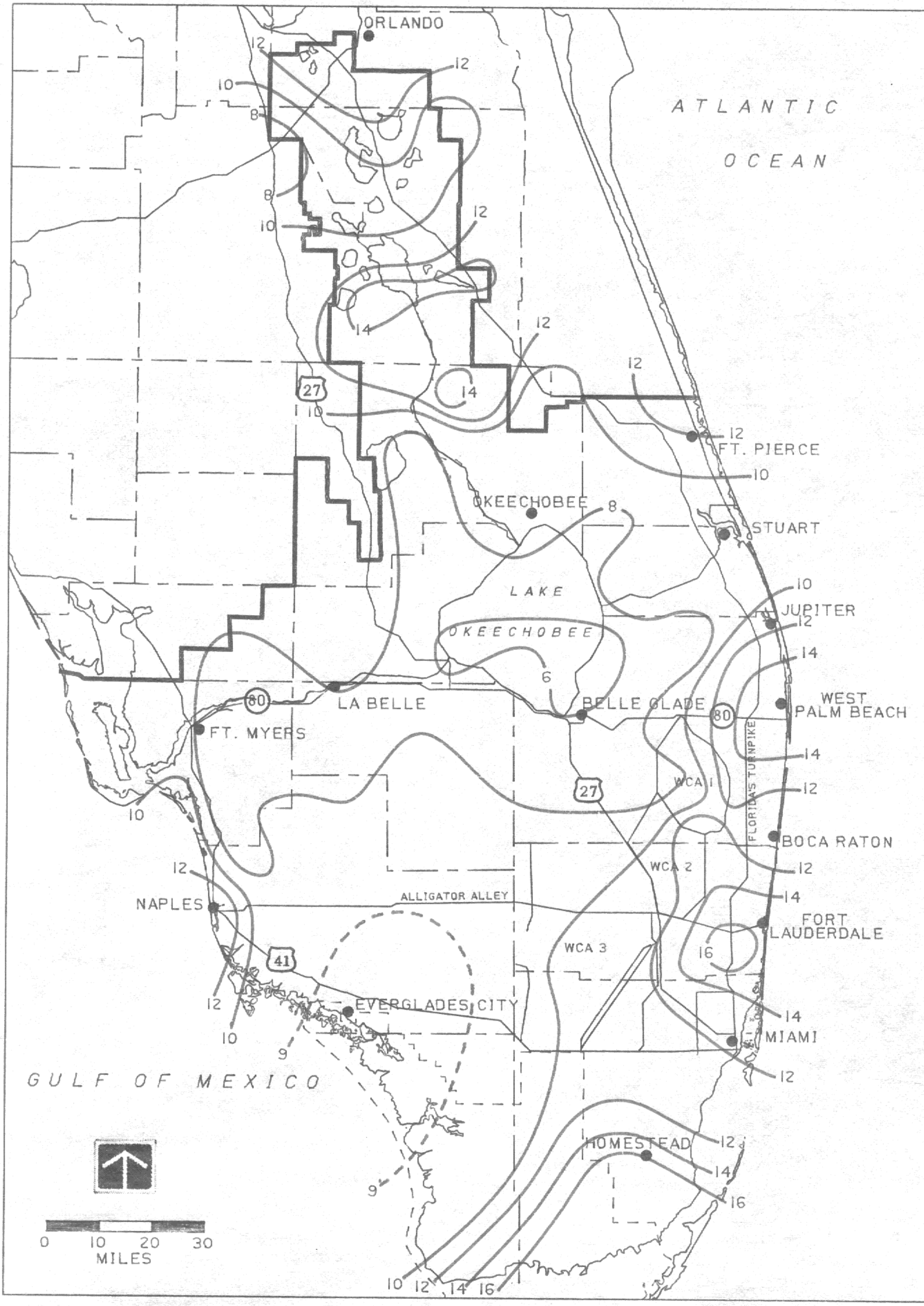

FIGURE 24. 1980-1981 DRY SEASON

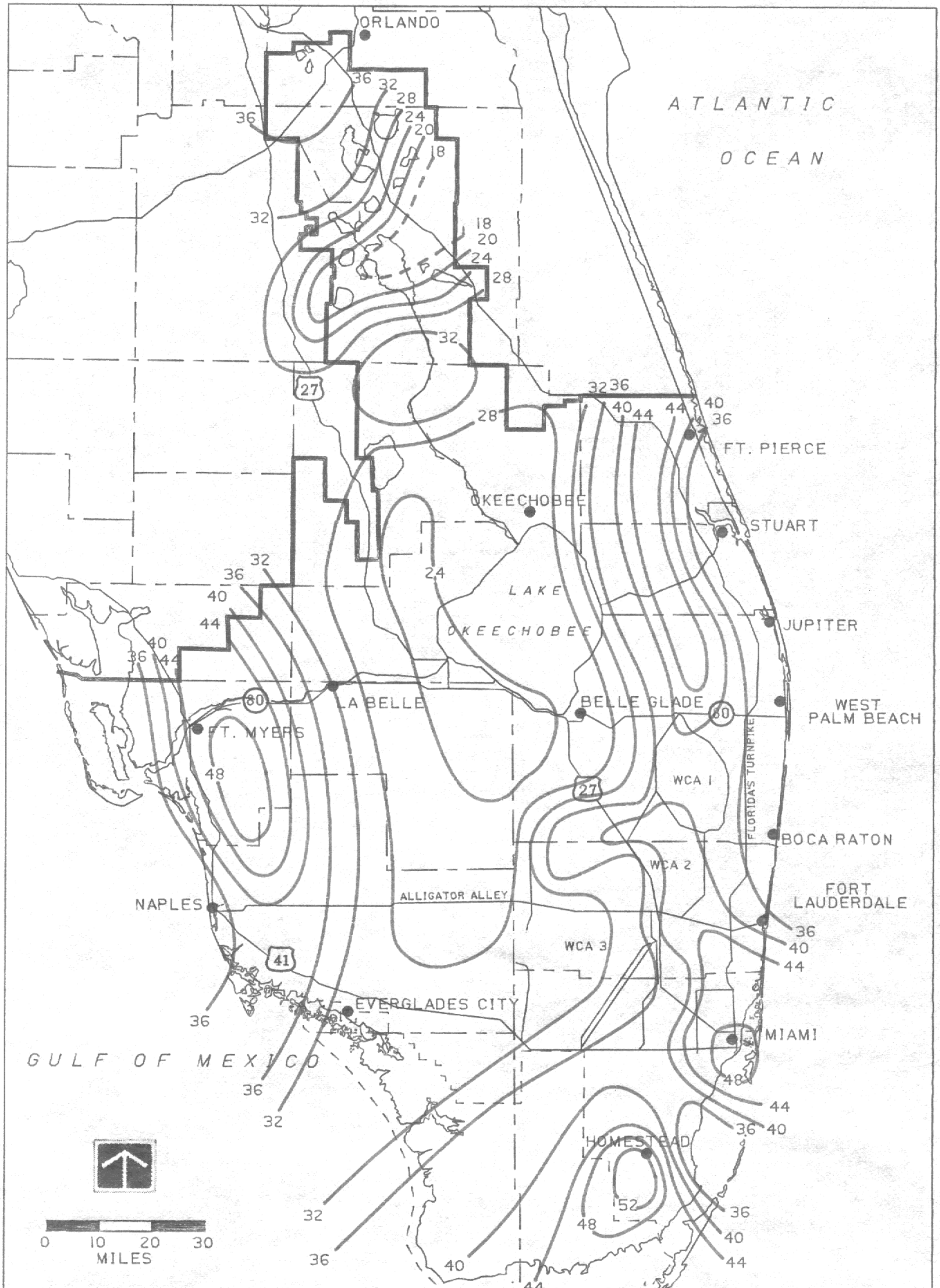

FIGURE 25. 1981 WET SEASON